



This fact sheet briefly describes NASA's efforts for cleaning up chemicals from groundwater beneath the Jet Propulsion Laboratory. A more detailed description of all JPL cleanup activities is available at local Information Repositories (listed on the back), and online at <http://JPLwater.nasa.gov>.

CLEANING UP GROUNDWATER NEAR JPL

Site History

NASA's spacecraft capable of robotic exploration on the surface of Mars originated from the Jet Propulsion Laboratory (JPL) near Pasadena, California.

It was almost sixty years ago that engineers at JPL collaborated with the United States Army to develop the first rocket ever to enter outer space, which climbed to an altitude of 244 miles. Much has changed since then, including JPL's waste management practices. In those days, wastes collected from JPL laboratories were disposed in ground seepage pits - a waste management practice that was common in the 1940s and '50s. Beginning in 1955, a sewer system was installed and the use of seepage pits stopped. However, some chemicals disposed into these pits - volatile organic compounds (VOCs), used primarily as cleaning solvents, and perchlorate, a rocket propellant - have been found in the soil and groundwater beneath JPL and in some nearby water supply wells. In 1992, JPL was placed on the U.S. Environmental Protection Agency's National Priorities List for investigation and cleanup, and it became regulated by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

**Water supply officials
continue to test,
treat and provide
clean drinking water
to all the communities
surrounding JPL.**

Taking Cleanup Action

While developing final site-wide cleanup solutions for JPL, NASA wants to begin removing VOCs and perchlorate from groundwater nearby and outside of JPL boundaries (the area referred to as Off-JPL). While not the final cleanup solution, taking this interim cleanup step will have several benefits. It will:

- ▶Accelerate the cleanup process
- ▶Keep chemicals in the groundwater from spreading further
- ▶Protect public health and the environment

Evaluating Alternatives

NASA looked at a variety of alternatives that combined the best ways to pump the groundwater with the different technologies available for treating VOCs and perchlorate. Following a comprehensive comparison of alternatives, NASA will propose its preferred treatment system. The final selection will be made in cooperation with the local water purveyors, the regulatory agencies, and the community.

NASA's Interim Cleanup

For cleaning up Off-JPL groundwater, NASA is proposing to pump the water out of the ground and pipe it to a new treatment facility to remove the VOCs and perchlorate. Following startup of the system, the filtered treated water will be initially reinjected into the ground, and may later be provided to the City of Pasadena who, following regulatory approval, will make it available for drinking water purposes.

Removing VOCs

For treatment of VOCs, NASA is proposing to use a proven effective system called Liquid-phase Granular Activated Carbon. As groundwater flows through vertical tanks, very porous carbon particles attract and accumulate the molecules of VOCs where they can be removed from the water, collected and properly disposed.

Removing Perchlorate

NASA's evaluation of available treatment systems identified two effective options for removing perchlorate from groundwater. Both technologies underwent small-scale testing at JPL and have been effective in removing perchlorate to non-detectable levels of less than 4 parts per billion. Both options have been conditionally accepted by the State of California for treating drinking water and are being used successfully at other cleanup sites.

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Parts per billion, or ppb,
is a way to describe
extremely small
concentrations of a
substance - the number
of 'parts' by weight of a
substance per billion
parts of water.
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Treatment Option One

This system, called Ion Exchange, runs groundwater through tanks filled with millions of tiny resin (plastic) beads. When perchlorate touches the beads, perchlorate is exchanged with chloride and is removed from the water. The process is similar to that of a home water softener.

Treatment Option Two

In this system, called a Fluidized Bed Reactor, vertical tanks contain a bed of granular activated carbon where, when nutrients are added, naturally occurring bacteria multiply to form a thin layer over the activated carbon called a biofilm. As groundwater is pumped upward through the biofilm, the bacteria take in perchlorate and destroy it, reducing it to water and chloride. The water then passes through a filter to remove the bacteria.

To Learn More About It

Information on these technologies and other JPL cleanup activities is available online at <http://JPLwater.nasa.gov> and at the following Information Repositories:

La Cañada Flintridge Public Library
4545 Oakwood Ave.
La Cañada Flintridge,
California 91011
818-790-3330

Pasadena Central Library
285 E. Walnut St.
Pasadena, California 91101
626-744-4052

Altadena Public Library
600 E. Mariposa Ave.
Altadena, California 91001
626-798-0833

JPL Repository
(JPL Employees Only)
4800 Oak Grove Dr.
Bldg. 111
818-354-4200

For more information, contact

Merrilee Fellows

Water Cleanup Outreach Manager
818-393-0754

or

Steve Slaten

Remedial Project Manager
818-393-6683



NASA Management Office

4800 Oak Grove Drive
Pasadena, CA 91109